103. **Sialia sialis.** BLUEBIRD. — Crawford Co., Sept. 12, saw a number in the Kirtland Warbler region (Wood). Oscoda Co., June 13, Aug. 17, occasional; July 6, frequent; Sept. 12, very common, breeding, young seen. Alcona Co., Aug. 19, frequent. Iosco Co., Aug. 22, frequent.

UNIVERSITY MUSEUM, UNIV. OF MICHIGAN,
October, 1904.

REGURGITATIVE FEEDING OF NESTLINGS.

BY IRENE G. WHEELOCK.[1]

My claim upon your attention this morning lies in the fact that many years of field work, averaging three to five months each year, have been spent about equally divided between California and Illinois in obtaining the data which I shall present for your consideration. I am confident that it is accurate, and I believe that it is new. The field is large, it is practically unworked, and it offers a rich opportunity for original research.

Realizing that there is time to present only a small proportion of the mass of data at hand, I will pack facts closely and select from my records species representing as many families as possible. Of course it is necessary to record many broods of each species before we can claim that any peculiarity observed is a habit of that species. Having records of one hundred and eighty-seven broods (*not species*), I claim that every brood hatched in a naked or semi-naked condition was fed by regurgitation from a period varying from one day to four weeks. To those critics who believe that their own observations prove this statement untrue I would address two questions: First, *Have you determined accurately the age of the brood at the date of the record?* Because some birds regurgitate for one day only.

Second, *Just what is understood by "Regurgitation?"* As defined by Worcester, Webster and others it means "a flowing back," and

[1] Read at the Twenty-second Congress of the American Ornithologists' Union, Cambridge, Mass., November 29, 1904.

in this sense I use the term. It does not always imply pre digestion. It refers only to food that has been swallowed by the adult and carried in the craw to the young. Oftentimes there is no appreciable digestion of the raw material, as when a Cedar Waxwing swallows choke cherries and two minutes later disgorges them one by one into the mouth of the nearly fledged nestlings; or when the Nighthawk comes with throat full of fireflies and, according to Mr. Herrick, pumps the young full of the glowing mass; or when the Flicker empties her sack full of ant larvæ into the eager throat of her hungry offspring. An examination of the crops of the young immediately after feeding, in each of these cases, reveals food in a comparatively fresh condition except for a certain sliminess caused by the saliva of the adult. But, although the result in each of these instances is the same, the methods differ widely. For instance, the Waxwing simply fed the cherries one at a time exactly as he might have done had he brought each one singly. Yet we all accept the fact that the cherries were carried in his throat and consequently were *regurgitated.* The Nighthawk (I cite from Mr. Herrick) placed her capacious bill over, not in, that of the little one and allowed the contents of her throat to escape into the gullet of the nestling. But Mr. Herrick does not hesitate to pronounce this act *regurgitation.* The long, flabby throat of the young Flicker, on the other hand, requires some further help in swallowing, and hence the shaking process so distressing to witness. But I wish to emphasize the fact that *this elaborate process is no more truly regurgitation than is the quick ejection of food in the case of the Cedar Waxwing.*— The three cases cited, although differing so widely from each other, are unhesitatingly accepted by all scientists as examples of regurgitative feeding. All the instances I have recorded follow one of these three modes.

In obtaining this data several methods have been followed. In about one third of the instances it was possible to watch at close range, concealed either in ambush or by protective coloring in dress and by patience in remaining motionless. By close range I mean from ten to forty feet. With field glasses forty feet is practically two feet.

In cases where such watching was obviously impossible from the position of the nest or the intervening foliage, I was obliged to

be content with investigating the crops of the nestlings immediately after feeding. *This was done in all cases whether watched at close range or not.* As soon as possible after the parent bird had given the meal and left the brood, we took one of the little ones up and by touching it gently with a feather induced it to open its bill. Unless fed to a surfeit the nestling responded eagerly; and the feather, trimmed to a blunt point, was thrust into the throat, turned once and withdrawn. Usually sufficient food adhered to it to be placed on a slide and examined under a microscope if necessary. Whenever it was found impracticable to insert the feather we forced the young bird to disgorge by a slight pressure on the gullet. Often the skin of the crop was so distended and so transparent that it was possible to judge of the condition of its contents from an external examination. Usually the internal examinations were limited to one a day for each young bird.

Just here let me call your attention to a few salient points. First.— In every case offered in evidence the record begins on the day of hatching. *Data obtained without knowledge of the exact age of the young birds is incomplete*, and while more or less valuable is not sufficiently reliable to be used here.

Second.— That in every case the crops of the young were examined within five minutes, usually within two minutes after feeding was completed, and before any digestive process could have taken place in the throat of the young. This is a most important point *— that the examination of the crop was made before any digestion by the nestling could have been under way;* hence whatever state of digestion the food showed must have been effected in the throat of the adult before it was given to the young. Moreover, as soon as any food was given in a fresh condition by the adult the fact was at once apparent in the examination. In order to note the rapidity of digestion, I experimented with a brood of Thurber Juncos by feeding them fresh food and examining the contents of the craw at ten minutes afterward. There was practically no change in form and but slight change in substance, it being a trifle softer, and more slimy. The same experiment was tried with young Robins with the same result. In the case of Crows and Blue Jays digestion was somewhat more rapid.

The first brood that I recorded as feeding by regurgitation was

that of a caged German Canary. Hard boiled egg was swallowed by the adult and in about six minutes was passed on to the young in the form of a white mass resembling very moist library paste. This process was continued until the eyes were open and the pinfeathers showed plainly. American Goldfinches (*Astragalinus tristis*) nesting in July in the crotch of a sapling at Glencoe, Illinois, were next watched and fed their young by regurgitation of husked and partly digested seeds of the thistle. It was possible to see the food given and an examination of the crops immediately afterwards proved its character. It looked like cooked farina. These birds were fed by regurgitation during the entire period of remaining in the nest. Toward the last the character of the food changed in being less affected by digestion of the adult, that is, less mushy and glutinous, but the seeds were always hulled and softened, probably with saliva of the adult.

The nest of a Vesper Sparrow (*Poœcetes gramineus*) was discovered May first on the ground on a bare sandy knoll in a field at Evanston, Illinois. Sparse grass blades and thin lichen-like moss covered the earth, and in a slight hollow at the root of a clump of wild strawberries lay the nest. It contained three sparrow eggs and two eggs of the Cowbird, all of which hatched the next day. I removed the Cowbird's. By crouching behind bushes at the foot of a tree twenty feet distant, it was possible to see much that took place at the nest. The parent birds were fully aware of my presence and the male flew scolding to a branch in my view with a large insect in his bill. As soon as he fancied that he had attracted my attention to himself he dodged down behind a weed about thirty feet from the nest site, swallowed the bug and reappeared with a great show of courage. I turned from watching him just in time to see the female sneaking away from the real nest and knew that she had fed the little ones. An examination of their crops showed the contents to be a slimy mass, pale cream in color, evidently vegetable matter. Examination after subsequent feedings proved the food to be largely weed seeds, always hulled and partly digested. On the third day the larvæ of some insects unknown to me, macerated soft parts of grasshoppers and spiders, all partially digested, were found in the crops at different times. One of the examinations made on the

fourth day revealed part of a grasshopper in a nearly fresh condition. Evidently, feeding by regurgitation was giving place to fresh food. But the next feeding was by regurgitation again. By the morning of this day (the fourth) the little slits between the eyelids were well open and pin-feathers were showing along the feather tracks. All feedings recorded on the sixth day were of fresh food, mostly insects. No record was kept after the sixth day.

A pair of Chipping Sparrows (*Spizella socialis*) nesting in a thornbush at Cedar Lake, Indiana, May 16, were surprisingly bold in living their home life under our close surveillance. The wee brown mother allowed me to touch her when brooding her eggs, and after the tiny bits of bird life were hatched she fed them, by regurgitation, within four or five feet of the watchers, eight times in two hours. The unusually small amount of food found in the gullet of the young, however, convinced me that the meals were given too hastily for the best interests of all concerned. For the first two days the contents seemed to be soft, creamy white, very much like that fed the young canaries described previously. I am free to confess that all inspection of the food in this case was external only; for, so tiny were the nestlings and so thin the skin of their throats that I feared to use even the feather test lest I injure the delicate membrane. However, the actions of both adults at the nest could not be mistaken. After alighting on or near the edge, the one who had come to feed the young would seem to look at them for some seconds as if trying to decide which one to supply first. This is the interpretation often given by popular writers, *but the real cause of hesitation is shown in the swelling of the throat as the food rises to be disgorged.* As soon as all is ready, the act of feeding is too quick for even an 'instantaneous' to catch. Mr. Ned Dearborn, whose part in that valuable work 'Birds in their Relation to Man' is well known to you, is the only one I know of who has succeeded in photographing it. He has two fine negatives of the Goldfinches feeding by regurgitation, but for this one success has hundreds of failures to report. As for the Chipping Sparrows, a camera record of the act is, I believe, impossible. It is quicker when the food is regurgitated than later when fresh insects are brought, which must be

tucked carefully down into the throat and watched until they disappear.

In the case of the Chipping Sparrows, the first bit of fresh food recorded was a spider given on the afternoon of the fifth day. At this time the eyes were able to open and feathers were forming, though showing merely as dark hues along the feather tract. After this, the food consisted largely of grasshoppers, smooth caterpillars and a few moths.

A nest of Thurber Juncos (*Junco oreganus thurberi*) snugly hidden under the edge of a decayed log at Mt. Tallac in the Sierra Nevada Mountains, proved a most interesting find and added much valuable data for the finch family. So shy were the adults that it was impossible to watch the feeding from a nearer distance than thirty feet, and the protective color of both parents blending with the brown pine needles surrounding the nest greatly increased the difficulty. In these circumstances I was obliged to depend largely upon the condition of the food found in the crop of the young to prove the method of feeding. On the day of hatching, June 11, fifteen feedings by regurgitation took place between 8 and 11 A. M. During this period I examined the crops five times within three minutes after feeding, — that is, each nestling was examined once. In every case the food was found to be partially digested, forming a grayish, slimy mass mixed with darker. Only one of the five crops showed seeds; the others, insects. During the second day the meals were more frequent and in two hours, from 9 to 11 A. M., the male came to the nest six and the female eight times. From 1 to 2 P. M. there were eleven feedings. Examination of the crops showed the same condition as on the previous day. There was no record on the third day. The fourth day differed from the first and second days in the large amount of vegetable matter found in the food, and also because four of the fourteen feedings recorded on this day were of fresh food. The vegetable matter found in the crops was small, round, highly mucilaginous seeds from some weed unknown to me. The fresh food consisted of large insects which had been carefully denuded of wings and legs before being given to the young. On the fifth day all food given was fresh,—that is, unregurgitated; feathers were commencing to show and the

eyes were open. On the sixth day, being compelled to leave that vicinity, I kidnapped two of the young Juncos and bringing them across the divide completed the study in Chicago.

Among the thrush family the American Robin (*Merula migratoria*) first claims our attention from its commonness. The pair whose record I offer you nested at the top of a trellis under the eaves of a veranda at my home, and in unobstructed view from a window five feet away. It was their third season in that dooryard and they paid no attention to the observers at the window, and, after the first day, made little protest against examination of the young.

On the first day, the crops of the nestlings contained balls of partially digested earth worms and white grubs, very jelly-like and with much saliva. On the second day, the food was of the same character but mixed with darker masses which seemed to be the abdomen of spiders; no legs or other hard portions were found in it, however, until the third day, when two bits of spider legs and balls of grass were discovered. Early on the morning of the fourth day an earth worm, thoroughly macerated, was given fresh to one of the nestlings. This was the first fresh food I had seen given. During the fourth day the food was all administered in a fresh state, and consisted of earth worms, grass, grubs and various species of insects. It was warm, wet, April weather and earth worms were the most abundant food, which doubtless accounts for their occurring in such quantities in the food of the young. June broods that I have recorded have more often fed upon fruit, caterpillars and grasshoppers.

Bluebirds, nesting for several seasons in the same deserted woodpecker's hole in an old tree on our lawn, furnished data for the statement that their young are fed by regurgitation until the fourth day, when this is varied with fresh food for a day; but, from the sixth day on, all the food given is in a fresh state. Insects and bits of grass formed the entire supply.

The Wood Thrush was found to resemble the Robin closely in nesting habits, but its bill of fare is more like that other thrush, the Bluebird. The young were fed by regurgitation for three days on soft parts of insects, crushed and swallowed by the adults, but only partially digested.

In the thrasher family records were made of the Brown Thrasher (*Toxostoma rufum*) and the Catbird (*Galeoscoptes carolinensis*). The nesting habits of these two species are very similar. The difference lies chiefly in the large amount of fruit eaten by the Catbird. This was especially apparent in the crops of the nestlings, even in the first two days when feeding was entirely by regurgitation. The young Thrashers had been fed upon ants and spiders chiefly, while the Catbird nestlings, recorded at the same date, May 30, showed traces of strawberries, beetles, and larvæ of insects.

As if to assist in my collection of hitherto inaccessible data, a pair of Baltimore Orioles (*Icterus galbula*) swung their cradle over a third story balcony of a residence occupied by interested friends who at once notified me. The house stood on one of Chicago's busiest residence streets, but the birds reared their brood unmolested by anyone save a meddlesome bird lover who insisted upon knowing all that took place in the nursery and exactly what food was given the young orioles. On the first day, feeding by regurgitation took place at intervals averaging twenty minutes for each nestling. As the nest was not more than three feet from the window, it was possible to watch just what was being done and to make examination of the young as often as seemed expedient. One particularly noticeable fact was that the female came to the nest much more freely than the male, and fully twice as often. Also, she invariably turned her back to the observer, shielding the young from sight with her body, while the male alighted as far from the window as possible and fed by little pecks with one eye constantly on us. The food given was the soft part of grasshoppers and dragon flies, and the larvæ of different species of insects mixed with green leaves,— all thoroughly macerated and partially digested. No traces of fruit were found. On the third day, the male was seen to give the soft part of a dragon fly, having removed the wings in full view of the observer, without first swallowing it himself. After the fourth day all food recorded was given in a fresh condition. In the case of this brood no fruit was fed the nestlings, possibly because of the difficulty of procuring it.

Among other members of this family, Brewer Blackbirds (*Euphagus cyanocephalus*) in California and both Red-winged(*Agelaius*

phœniceus) and Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*) in Wisconsin were recorded; and, in the case of the Yellow-head, the nest was removed from its original site to one better adapted for observation. The food habits of these three species are so similar as to be nearly identical. The young are fed by regurgitation for two days, afterwards by both methods for two days, then entirely by fresh food. Examination of the crops of the broods reared in late June showed, on the first day, snails, waterslugs and larvæ all partially digested. On the second day, insects denuded of wings, legs, and all hard parts, and thoroughly crushed as well as predigested, were found mixed with occasional water moss. The third day showed little change in the menu but the food was less digested and, on this day, occasional meals of fresh food began to supplant the regurgitated.

Meadowlarks, both the western (*Sturnella magna neglecta*) in California and the eastern (*Sturnella magna*) in Illinois, were recorded. They feed by regurgitation for three days, gradually giving fresh food until by the fifth day all food is fresh.

In most parts of the Sierra Nevada Mountains, Pigmy Nuthatches (*Sitta pygmæa*) are very abundant and seem to be absolutely without fear. One pair, nesting in a pine stump, went in and out their small doorway even while my eager fingers were trying to enlarge it and scrambled over my hand repeatedly in so doing. In this case there were newly hatched young in the nest; and, as the adults went inside to feed them not more than two feet from my eyes, I was able to see perfectly that the food was carried in the throat. Of course this could only mean regurgitation; but not until the third day could I get at the nestlings to examine the crops. The contents consisted of larvæ of insects and ant eggs, all partially digested. On the fifth day the examination indicated the presence of fresh or unregurgitated insect and grass food. On the sixth day most of the food given was fresh, but on two occasions the adults visited the nests with no visible supply in the bills. No record was kept of this brood after the sixth day. Two other broods of this species were recorded at the same place and with practically the same results. The interval between feedings shortened with the increasing age of the nestlings and on the last day of the record twenty-eight meals were served by one pair

between eight and ten-thirty A. M. as contrasted with seventeen in the same length of time on the day of hatching.

Slender-billed Nuthatches (*Sitta carolinensis aculeata*) are so much shyer than their small relatives, the Pygmies, that they are much more difficult to observe. A nest found in an old woodpecker hole twenty feet from the ground at Romardennan, California, May 3, contained five eggs just ready to hatch. On May 5, four nestlings and one infertile egg were found in it. Feedings by regurgitation took place for one day only, and the contents of the crops were insect eggs and larvæ. The parents resented our meddling after this examination and did not come to the nest again for more than two hours. On the second day, to my great surprise, one of the adults brought a grub in his bill, thus showing plainly that fresh food was being given. Unfortunately for the record either my investigations caused the Nuthatches to desert their brood, or both parents fell victims to a collector; for the third day found only the lifeless bodies of the young in the nest and no sign of the adults about the place.

For many years I had watched in the vain effort to obtain a complete record of some species of Tanager. Nests in abundance we had found, both of the Scarlet and Summer Tanager of the East and the Louisiana Tanager in California, but so inaccessible were they as to make accurate data impossible. Of three nests of the Scarlet Tanager (*Piranga erythromelas*) within watching range, two were deserted before incubation,— one because a Cowbird laid her eggs in it, one because of our meddling. The third, in a tangle of wild grapevine at the foot of a bluff, with Lake Michigan dashing spray over it at every easterly gale, was the only one to fulfill our hopes. It was a curious location for both nest and grapevine, and we could hardly credit our good luck when we stumbled upon it in descending from the Cliff Swallows seventy-five feet above. It contained, July 2, four eggs which hatched two days later. The old birds were very shy, refusing to come to the vicinity when any watcher was in sight. We could keep no record of the visits of the female because of her protective coloring; but, concealed in a deserted bathhouse, we were able to see the bright gleam of scarlet as the male came to and left the nest. An examination of the young, immediately after his departure on the first day, showed

their crops full of insect food in advanced digestion. Two subsequent examinations gave the same result. It differed in no respect from results of similar examinations of young broods which we had watched at close range while they were being fed by regurgitation. On the second day, by burying myself in the sand and covering head and shoulders with a tree branch, I managed to see both parents feed the young. There was the same hesitation, the same swelling of the throat, and the same quick pouring of the food into the open bill of the nestling, that we had seen in the case of all the perching birds during the first few days of feeding their young. The examination, however, revealed insect food of a dark color. I recorded it as ants, with a question mark. Whether our watching had exposed this brood to other meddlers, or whether the parents deserted them, I know not; but the third day found the nest empty, and the record is only valuable as establishing the feeding habits of the first three days. I offer it hoping someone may take up the clew and obtain fuller results.

One of the most interesting of the Swallow records is that of a pair who plastered their mud nest under the eaves of a bungalow at Lake Pewaukee in Wisconsin. Standing on the ground I could reach into the nest and, but for the overhanging eaves, could have looked into it. The location was much more like a Phœbe's nesting site, yet the housekeepers were Cliff Swallows (*Petrochelidon lunifrons*). The young were hatched on July 10, and were larger in proportion to the size of the adults than any nestlings I have seen, except young Purple Martins. From early morning until after sunset the parents were busily flitting to and fro over the marshy land and bringing their harvest of gnats to the little ones. No tent was necessary to watch this brood. Their home life was carried on with the utmost freedom while I sat hour after hour within five feet of the nest. In this they were like the Purple Martins again, who insisted upon entering the nest hole with food while I was reaching in for the young. On the first day, the young Eave Swallows received forty-six meals in three and one half hours, all by regurgitation. The adult never failed to alight on the edge of the pocket shaped nest in such a way as to stand between me and the young so that I could not see exactly what took place. After waiting several seconds, the parent leaned over

quickly and delivered the food it had brought in its throat. Twelve examinations of the craws were made on the first day and fourteen on the second day. The only difference was in the slightly more solid condition of the food on the second day. Ants, gnats and small flies had been given, all partially digested and mixed with an unusual amount of saliva. Large insects were brought at intervals on the afternoon of the fourth day, but toward night the feedings by regurgitation were resumed. This was proved by the change in the character of the food found in the craw as well as by noting the condition of the adults' throat and bill as they came to the nest. At this time the heads and backs of the young were covered with a thin down, the skin had turned darker and the eyes were commencing to open.

On the sixth day ten regurgitative feedings and sixteen fresh meals were recorded in two hours from four to six P. M. There was no further record until the tenth day when four regurgitative and eleven fresh feedings were given in one hour from four to five P. M. On the eleventh day this brood came to an untimely end through the fall of the nest in a hard rain storm, and the record was not finished until 1901, when I saw another brood fed by regurgitation on the day of leaving the nest.

Study of the nesting habits of a Hutton Vireo (*Vireo huttoni*) at San Jose, California, proved to me how like this western species is to his eastern cousin, the Warbling. The records of the two are almost identical. The dainty cradle of the Hutton Vireo was swung from the lower branches of a sapling less than seven feet from the ground on the side of a hill. By sitting opposite and a few feet higher I was able to see most that went on in the vireo household. The four eggs, hatched May 14, had been incubated only eight days. At ten A. M., when I began the record, both adults were busy supplying food to the young and, during two hours, visited the nest sixteen times, brooding a good deal between times. Every feeding was by regurgitation. External examination of the crops showed the thin, pasty contents usual on the first day. I can describe this in no better way than to say it is like thin, whitish library paste, occasionally streaked with darker color.

On the second day, May 15, meals were given by regurgitation nineteen times between ten and twelve A. M. The nestlings,

seemed to have more than doubled in size and their crops plainly indicated a darker color of the contents than on the day before. The feather test was used in this examination and revealed a slimy formless substance too far digested to be identified. As usual, this examination was made immediately after the young had been fed, and the result would seem to indicate that Vireos digest the food more thoroughly before regurgitation than do most birds. On the third day, the first meal of fresh food was recorded at 10:30 A. M. It was a large spider and was plainly visible in the bill of the adult. At 10:47, a feeding by regurgitation took place with two nestlings and examination showed that it consisted of small insects. At 10:52, another spider was given and at 11:10, several small worms were brought as food. At 11:35 the entire brood were given something by regurgitation. Examination of the crops made me suspect that this was water, for only a fluid was apparent. During the afternoon of the third day, feedings recorded were by regurgitation. When four days old the young vireos were still quite naked, only a thin down covering their upper parts, and their eyes were just beginning to open. On this day they were fed both by regurgitation and fresh food. The contents of the crops revealed spiders, caterpillars, beetles and small insects, both partially digested and fresh. Of eighteen feedings in two hours, eleven were by regurgitation. On the fifth day only one regurgitative feeding was recorded, and from this time on all feedings were of fresh food.

On page 126 of Prof. Weed's 'Birds in Relation to Man' he quotes Prof. Herrick as saying of a brood of Red-eyed Vireos: "On the third day the mother brought a ripe red raspberry, its juice fairly streaming down her bill." Prof. Herrick's statement occurs on page 68 of his 'Home Life of Wild Birds' and is correctly quoted except that the *third day* referred to is the third day of Prof. Herrick's record, not of the life of the vireos. He says that the young vireos were four or five days old when he began to watch them and, consequently, they were seven or eight days old when this red raspberry was brought. In the three vireo broods I have recorded, no fruit was found in the crops until the sixth day when, in the case of the Red-eyed, two blueberries were discovered. Cassin Vireos whom I recorded, were fed bits of leaves,

whether accidentally or otherwise, but I never found any trace of fruit in the crops.

More interesting than the Waxwings, because less common, is its western cousin, the Phainopepla (*Phainopepla nitens*). In feeding and nesting habits these birds are so like the Waxwings that they may be taken as a type of both branches of the family. The brood whose record I offer here were hatched on June 2 in a nest built by the male in an old oak tree near Pasadena, California. They were naked except for a thin covering of down on head and back, and were about the size of newly hatched Red-winged Blackbirds, which they also resemble in color. The adult Phainopeplas were soon reconciled to the presence of a motionless observer, and came to the nest freely after the first few hours. On the first day, sixty-eight meals were recorded between one and six P. M., and all by regurgitation. The adults alighted on the edge of the nest with the gullet visibly swollen and, after a moment of waiting, fed the little ones in the same manner recorded of the Waxwings.

On the second day, in three and one half hours, the male brought food twenty-eight times and the female twenty-one times. The third and fourth days registered an increased frequency in the visits of the male, on an average about two out of three meals being given by him, and all feedings by both parents were regurgitative. The intervals of feeding varied with the time of day, being shortest early in the morning when they were sometimes only five minutes apart.

For the first four days the craw showed only insect food, always in a partially digested condition; but on the fifth day at least one feeding was of pepper tree berries regurgitated in a fairly fresh state. From the sixth day on, part of the meals were regurgitated and part not. Large insects were given fresh; berries by eructation. The craws were examined once a day until the nestlings were twelve days old when, on leaving that locality, I was obliged to close the record. Up to that time the contents showed large insects and berries of various sorts, in about equal proportions.

California Bush-Tits (*Psaltriparus minimus californicus*) are about the most fascinating feathered mites of my acquaintance. A paper twice as long as this could not do justice to all their tricks and

manners. In some localities they are as common as Bluebirds in Illinois, and no bird is more easily observed. The pair of this record nested in an evergreen tree near the reservoir of Elysian Park, Los Angeles. On the day of hatching, as soon as the young were fed, we cut a slit in the nest and investigated. The adults are scarcely as large as Kinglets and the nestlings were about the size of a bumblebee, certainly less than an inch long. Obviously any thorough examination of the crops was impossible, but its external appearance was like that of the German Canary, soft, creamy and yellowish in color. Whatever the food, it was nearly digested when given. For four days a diligent watch was kept and not once was any visible food brought to the nest. No record on the fifth day. On the sixth day, a second examination revealed crops full of insect food partially digested. On this day also we saw one of the adults bring a grub to the nest. The eyes were now open and the skin was covered with down. No record was kept of this brood after the sixth day. In the crops of other broods, which were feathered and ready to leave the nest, we found insect eggs, grubs and caterpillars. In the case of the first brood mentioned, feeding was surprisingly frequent, the thirty meals in two and a half hours being the highest I have recorded of any species.

The habits of the Sapsuckers are typified by a pair of Williamson Sapsuckers (*Sphyrapicus thyroideus*) of California whose record I now offer you. Half way up from the ground, in a burned pine stump, was the entrance to the nest and easily accessible to the small boy climber who was my chief aid. Sometime before this I had discovered a nest similarly located but nearer the ground, and had found the adults so shy that I had not kept a record of them, fearing a repetition of the Slender-billed Nuthatch tragedy. But the second pair of Williamsons were resigned to their fate. With scarcely a scolding protest they fled, leaving us to investigate and returned as soon as we had gone. It was May 24 when the eggs hatched, and five naked nestlings lay cuddled together on the hard wood of the nest. At the first absence from home of the adults, two of the young were lowered to me for investigation. They had just been fed and were surfeited. The contents of the crops were thick fluid, very sticky, as indicated by the inserted

feather. Both adults came to the nest at frequent intervals throughout the first day, but never with any food visible in bill. These conditions continued up to the eighth day when the first trace of fresh solid appeared in the crops. By this time the adults were sufficiently brave to come to the nest with us in sight, fifty feet away. On the ninth day the female was seen to bring insects eleven times and the male six times, the other feedings being from food carried in the gullet. The young sapsuckers matured slowly and had scarcely begun to feather up to this date. No record was kept after the ninth day, as we left that locality.

The Northern Pileated Woodpecker feeds by regurgitation as conspicuously as do the Flickers, and for the same reason; namely, that his food is largely ants' eggs and larvæ with which he fills his gullet to pour them out into the throats of the young.

In the case of Kingfishers (*Ceryle alcyon*) nesting in a low sand bank at Riverside, Illinois, we found data valuable and interesting. By care in concealment we were able to discover that the adult came to the nest on the first day with no visible supply of food in the bill but with a gullet conspicuously swollen. We had previously excavated the nest from the rear making a false back to it so that it would be protected from the weather and at the same time open easily. As soon as feeding was completed and the adult out of sight, we opened the nest at the false back, took out the young, then one day old, and examined the crops. They contained a dark gray, oily mass, nearly fluid and very ill smelling, but with no bones or scales in it. If fish they were very small and digested. Returning the young fishers to the tunnel, we closed it. Two days later the experiment was repeated with the same results. Four days later, or the seventh day after hatching, we examined again. This time one of the nestlings had swallowed several small fish about one and one half inches long and the others were still hungry. As yet we had not seen either of the adults bring visible food and the most frequent feedings had been forty minutes apart, I believe all by regurgitation. No record was kept from the seventh to the fourteenth day when an examination was made for the third time. We now found the young showing well developed pin feathers, and there were traces of disgorged fish bones and scales in the nest which had not been

there before. The crops examined showed fish only slightly digested and regurgitative feeding had evidently given place wholly or in part to fresh food. On this day one of the adults brought several fish, possibly four inches long to the nest in different journeys. Examinations made on the twenty-first day revealed the same food conditions as the fourteenth. The pile of fish bones and scales was a trifle larger but was partially buried in the earth. There was surprisingly little of this debris in the nest or tunnel but the ground seemed to be saturated with fishy oil. On the twenty-eighth day the young kingfishers resented being examined or photographed, and made good their escape when taken from the nest.

I am sorry that there is not time to give you records of the Cassin Kingbird, nesting at Pasadena, California, who fed his young by regurgitation for one day; of a Loggerhead Shrike who impaled each grasshopper on a barbed-wire fence, ate the soft parts, and ten minutes later regurgitated them into the throats of his nestlings; of the western Gnatcatchers at San Jose, California, who were fearless in coming to the nest while I bent over it and who gave all meals by regurgitation until feathers were well started over the little ones; of the Sierra Creeper who tucked his nest behind the bark of a dead pine tree and until the nestlings were four days old was never caught carrying visible food to them; of the Audubon Warblers at Lake Tahoe, California; the Yellow Warblers and American Redstart in Illinois, all of whom fed by this method for the first three days.

All of my records of the Lark family have been incomplete and are therefore unreliable.

Among the water birds I have found the Herons, Bitterns and Cormorants feeding by regurgitation in the same violent fashion as the Flickers. There is no record of this method among the game birds, and but few among the birds of prey. The distinction seems to be the condition of the young at hatching. Those species which are covered with down are usually given only fresh food. Although lacking the positive proof of the examination of crops I have reason to believe that the Marsh Hawk is an exception to this rule and regurgitates its food for one day.

Explanatory Note.

At the recent Congress of the A. O. U. in Cambridge the author's attention was called to some parts of the introduction to 'Birds of California,' which have created a wrong impression concerning the work, among those lacking time to investigate the matter. Hence, it seems best to state definitely that *the book* is not the result of one season's reconnaissance in the field; it is based upon the author's own field notes, begun in October, 1894, *and continued, with few interruptions, until July, 1902.*

These years of data gathering *in the field* were supplemented by two years' work upon the text.

The "test study" refers only to the last five months, which were spent, as stated, in ascertaining so far as possible what birds were *most commonly* met with by the casual observer. The list of places where observations were made includes all places visited during the eight years mentioned, and does not refer alone to the last trip.

Also, the word "cases" on page 13 is used as synonymous with "instances," the specific meaning intended being "broods."

When Mr. F. M. Chapman, in reviewing the book in 'Bird Lore,' interpreted 'cases' as 'species,' the author was appalled and at once wrote to Mr. Chapman, asking that this error be corrected in the next issue. Owing to Mr. Chapman's absence in the Bahamas, the letter failed to reach him and the correction was not made.

TWENTY-SECOND CONGRESS OF THE AMERICAN ORNITHOLOGISTS' UNION.

THE TWENTY-SECOND CONGRESS of the American Ornithologists' Union convened in Cambridge, Mass., Monday evening, November 28, 1904. The business meeting was held in Mr. William Brewster's museum, and the public sessions, commencing Tuesday, November 29, and lasting three days, were held in the Nash Lecture-room of the University Museum.

BUSINESS SESSION.— The meeting was called to order by the President, Mr. Charles B. Cory. Sixteen Fellows were present. The Secretary stated that at the opening of the present Congress